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*An Elementary Treatise on Qualitative Analysis.* By J. F. SELLERS. Revised Edition. Boston: Ginn & Co., 1909. Pp. ix+176. \$1.00.

In this volume the author has set himself the task of presenting to beginners in the study of qualitative analysis a text which, while making only a moderate demand on their time, should nevertheless train them in the use of the most recent methods and develop the subject from the modern point of view.

In the latter purpose the book can be but partially successful. Any text which introduces the theory of solutions in such a manner that it may be taken up either at the beginning of the course or at the end, or omitted altogether, must necessarily fail in making the theory an integral and readily comprehended part of the subject. Only by reiterated and continuous application of the theory to the actual reactions of analysis can the student be made to see its fundamental importance and helpfulness. Thus it is a serious fault to omit, at the time when the experimental study is introduced, the full discussion, from this point of view, of subjects such as the precipitation and solution of the sulphides, hydrolysis, and the formation and decomposition of complex ions. It is unfortunate, also, that those illustrations which are given for the laws are chosen so largely from the reactions of highly ionized salts, to which the simple laws cannot be rigorously applied. Of course the book is so written that these omissions can be easily and logically supplied by a competent instructor, but the reader is led to believe that the book is intended to satisfy this demand rather than to create it.

The discussion of the reactions from the purely chemical side is very good and almost free from error. The "preponderance of authority" does not favor the formula  $2\text{AgCl}_3\text{NH}_3$  for the solution of silver chloride in aqueous ammonia (p. 77), although there is a solid salt of this formula; manganous salts do not form stable complex ions with ammonia in the presence of water (p. 170); the precipitate obtained by treating bismuth salts with sodium stannite solution is probably a mixture of metallic bismuth and bismuth trioxide or bismuth alone, but not bismuth monoxide (p. 83); arsenious sulphide and not arsenic sulphide (p. 90) is the chief reaction product from the treatment of hot arsenic acid with hydrogen sulphide; a mixture containing mainly ferric sulphide, and not ferrous sulphide is obtained by the precipitation of ferric salts by ammonium sulphide (p. 108); and the reason for writing the formula of permanganic acid as  $\text{H}_2\text{Mn}_2\text{O}_8$ , is not clear. But these errors are small in number and the large mass of the reactions are correctly and clearly discussed.

The systematic analysis is chosen well from the most recent work and the methods are clearly described. A valuable feature of this part of the book, rare in texts of its size, is the discussion and employment of the spectroscope. It should be pointed out that the student will have difficulty in his tests for bismuth and for cadmium on account of the incomplete removal of lead by the method given, and that he might confuse calcium and strontium because he is not cautioned to make confirmatory tests. Both of these difficulties are in a way guarded against by the author—the former by a warning, and the latter by an alternative method.

The book is well set up and is free from typographical errors. It seems unfortunate that the notes should be placed together at the end of the volume, for on this account important points may escape the student's attention. Thus the danger attending the "Marsh test" is mentioned only in a note, which, not being

on the page on which the experiment is described, might not be seen till too late; and a similar criticism might be made of the lack of warning, in the proper place, of the dangerous character of prussic acid and of the precautions demanded in the use of cyanides, especially when treated with acids.

It will be seen from this discussion of the book that it contains many valuable features, and that its use in the classroom should produce good results if supplemented by a more intensive theoretical discussion on the part of the instructor, or if used in elementary laboratory courses in which the theory of solutions is to be omitted or merely touched upon.

*A Manual of Qualitative Chemical Analysis.* By J. F. MCGREGORY. Revised edition. Boston: Ginn & Co., 1909. Pp. xiv+135. \$1.00.

This book represents essentially an outline and laboratory manual for the study of qualitative analysis. The discussion of modern theories is avoided, and the chemistry of the reactions involved is treated chiefly by giving the names and formulae of the reaction products. This treatment of the subject is not in line with the developments of the past fifteen years in the teaching of chemistry. Judging the book, however, from the point of view from which it was written, we may say that the material is well presented. Only a few of the errors found in the old textbooks have crept into this one: thus the formula for silver ammonia hydroxide is given as  $\text{NH}_4\text{AgO}$  instead of  $(\text{NH}_3)_2\text{AgOH}$  (p. 3), and the formula for the solution of silver ammonium chloride is incorrectly given as  $(\text{NH}_3)_2(\text{AgCl})_2$  (p. 4); ferrous sulphide is named instead of ferric sulphide as the reaction product when ammonium sulphide is added to ferric salts (p. 17); and the author fails to call attention to the fact that cupric salts are largely reduced by potassium cyanide in ammoniacal solutions, yielding chiefly potassium cupro-cyanide rather than the corresponding cupric salt (p. 8).

The systematic analysis is well arranged, but some of the separations of the groups are a trifle complicated. This is particularly true of the iron groups, for which the old ammonium chloride and ammonium hydroxide separation is recommended. The necessary precautions are described, but the author does not state in detail what all of the difficulties are, so that the student is compelled to work blindly. Thus, while it is explained that in the presence of phosphates, etc., the alkaline earth group may be precipitated with the aluminum group, it is nowhere made clear that this may be true also of members of the zinc group. Finally, attention should be called to the fact that the author suggests for the purpose of removing iodine the addition of ferric chloride to a solution which is later to be tested for chloride (p. 111).

Aside from these errors, the book should prove useful in a course in which it is desired to omit the modern theories, for it contains, in very compact form, a great deal of information which students in qualitative analysis must have.

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